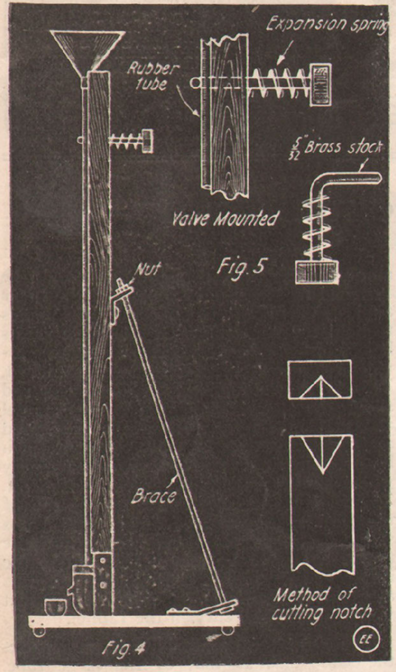
fore the rubber tubing is put on, the glass should be smeared with a thin layer of vaseline. After the rubber tube is put on, black thread is wound tightly around each joint and another application of vaseline is smeared over the thread and joint. This procedure produces a joint that is very near to being absolutely air-tight and such joints are positively necessary to the successful operation of the pump.



Side View of Home-made Mercury Vacuum Pump Which Is Suitable for Exhausting Geissler Tubes, X-ray Bulbs, Lamps, Coherers, and a Host of Other Things Dear to Every Experimenter's Heart.

The little valve at "B" was developed by the writer and is simplicity in itself. It is shown in detail in Fig. 5. By pressing the knob, the pressure of the arm on the tubing is overcome and mercury is permitted to flow (for a fraction of a second) from the funnel into the tube. Releasing the pressure causes the spring to bring the arm back to its original position where it pinches the rubber together and prevents the flow of mercury. When the pump is not in use, the arm should be turned so it will not come to rest upon the rubber tube as permanent pressure will injure the tubing.

To indicate the degree of vacuum attained at any stage of the operation, it will be necessary to make a suitable scale on the standard at the side of the long glass tube. The lines are drawn ½″ apart and after marking them with a soft pencil the lines should be painted over with white "show-card" ink applied with a very small brush. Such a scale stands out prominently and adds to the appearance of the instrument considerably.

When the pump is operated, the vessel to be evacuated should *not* be connected to the tee by means of a long rubber tube as the tube will be pressed together by the atmospheric pressure on the exterior (14.7 lbs. to the square inch) and the further passage of air from the vessel will be interfered with if not altogether prevented. This difficulty can be overcome by using glass tubing with small pieces of rubber at the joints to produce flexibility. All joints should be prepared according to the preceding directions.

When the pump is operating properly, the mercury will fall thru the long glass tube in separate little columns and each column acts as a piston pushing air before it. The valve at the top of the standard should be manipulated intermittently until the mercury in the tube rises to about 30 inches. This will indicate a vacuum sufficiently high for ordinary purposes.

A small receptacle is placed under the hole in the test tube to receive the mercury as it overflows. When the receptacle is full, the mercury is poured back into the funnel. *Do not permit all the mercury in the funnel to run out as this will destroy the vacuum.*

REGARDING TESLA AND OUDIN COILS.

By Carl H. Rauschenberg

Experimental Engineer

I present herewith two photos illustrating my cone-shaped high-frequency coil in operation. The photo Fig. 1 shows the enormous brush discharge from a wire attached to the upper terminal and also the discharge from top of coil. The photo Fig. 2 shows the spark discharge from a ball terminal placed on top of the coil to a grounded conductor.

This coil is very similar to one described in the "E. E." a short time ago (see May, 1917, issue). It was excited by a ¾ K.W. Thordarson Type-T transformer and an oil immersed condenser of about .008 M. F. using small 8-stud rotary gap running at 5,000 R. P. M.

The building of the coil was not so difficult, the method of building the secondary cylinder being somewhat different from usual practise. I went to a tinshop and told them to make me a cone of heavy galvanized-iron 15″ dia. at bottom, 7″ at top and 20″ high; *seamed on the inside.* This gave a perfectly smooth outside surface. I set this form on a table and cut large pieces of ordinary building paper of a shape to fit around it. I just merely built up the paper using ordinary glue until I had a thickness of about ⅛″. The paper can be cut so that it will fit the cylinder perfectly. The best method is to watch the tinner cut out the iron for the cone, take the dimensions he uses and cut your paper the same way. If the first piece of paper is cut the same size as the tinner cuts the metal it will be found to overlap slightly when fitted around the coil. This is as it should be and glue should only be put on the lap so that the paper is not glued to the form which must be removed later. After the first sheet is in place cut another sheet to the same dimensions and trim the edges till they just meet, fitting the paper before applying glue. Spread the sheet of paper on the floor, give it a thin coat of hot glue and quickly apply it to the form. Continue in this way until the desired thickness is attained. About 10 to 12 sheets will be sufficient. The joints should be staggered at various intervals around the cylinder of course. Leave the paper on the form for 48 hours or until perfectly dry and hard. Remove and give two coats of shellac inside and outside.

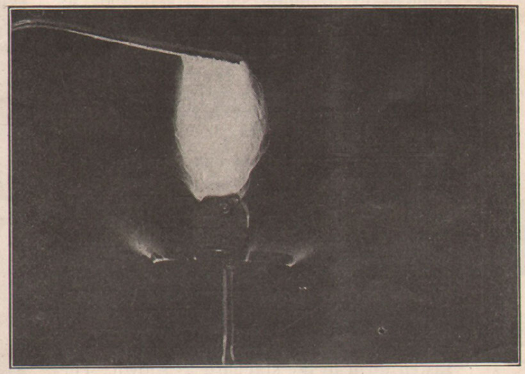


Fig. 2. Showing the Powerful High Frequency Spark Discharge From a Ball Terminal on Oudin Coil to a Grounded Conductor.

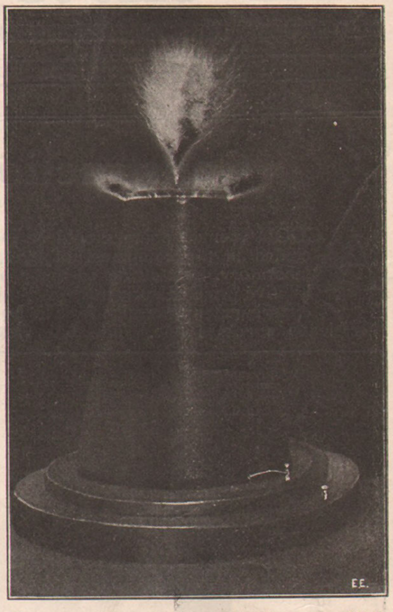


Fig. 1. Illustrating the Vigorous High Frequency Discharge From Free Electrode, As Well As Top, of Oudin Coil of Good Design.

The winding was done in the usual way using a string to space the turns and the finished winding given 5 coats of shellac to insulate it and hold it in place. The size of wire is not so important, mine being wound with 27 D.C.C. wire. Enameled wire should not be used.

Primary consists of 4 turns of copper ribbon, ¾″ wide wound into a spiral with a thickness of ordinary corrugated pasteboard (cut from a bread carton secured at a local grocery), between the turns. Primary leads are connected to binding posts leading to ends of primary ribbon; thus the entire 4 turns are always in circuit, tuning being accomplished with the secondary of a wireless oscillation transformer which is placed in series with condenser, spark gap and primary of Oudin coil; the wiring diagram shown in "E. E." several months ago being used.

I find the spark length from the Oudin type of coil to be not so long as that from the Tesla type with a given amount of power, but much heavier and capable of experiments not possible with Tesla type.

Some wonderful results can be had from the ordinary wireless sending set and in my opinion no amateur will regret the time and money spent in the building of a coil for use on his sending set.

Due to the advent of the war, we are particularly desirous of obtaining snappy manuscripts describing original and practical "Electrical Experiments."